

Title Submission:

Relationships between variability in the stratospheric polar vortex, upper tropospheric jets, tropopause, and UTLS ozone

Author(s):

Gloria Manney, NorthWest Research Associates, Socorro, NM, USA manney@nwra.com

Michaela Hegglin, Forschungszentrum Juelich, Germany m.i.hegglin@reading.ac.uk

Luis Millan, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA, luis.f.millan@jpl.nasa.gov

Krzysztof Wargan, SSAI, NASA/GSFC, MD, USA, krzysztof.wargan-1@nasa.gov

Michelle Santee, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA, michelle.l.santee@jpl.nasa.gov

Zachary Lawrence, unaffiliated, zdlawrence@gmail.com

Abstract

The impacts of stratospheric polar vortex variations on upper troposphere / lower stratosphere (UTLS) circulation and composition are not well understood. We use stratospheric polar vortex geometry / strength diagnostics combined with characterisation of tropopause and UTLS jets to show links between stratospheric polar vortex variability and regional variations in UTLS jet and tropopause characteristics. Polar vortex diagnostics are from Characterization and Analysis of Vortex Evolution using Algorithms for Region Tracking (CAVE-ART), while UTLS diagnostics are from JEt and Tropopause Products for Analysis and Characterization (JETPAC). We will present results showing UTLS jet and tropopause characteristics for strong and weak stratospheric vortex states (defined using vortex-focused metrics that are less dependent on geometry and position than commonly used diagnostics), as well as regional variations in correlations between CAVE-ART and JETPAC diagnostics. Furthermore, we will focus on preliminary results extending the stratospheric vortex, UTLS jet, and tropopause relationships to assess their impacts on regional ozone variations diagnosed from the M2-SCREAM (MERRA-2 Stratospheric Composition Reanalysis of Aura Microwave Limb Sounder) composition reanalysis.